RAD
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Installation and Operation Manual

HS-R

4-Channel Low Speed Data Module with V.110 Rate Adaptation

MEGAPLEX-2100 MODULE

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HS-R

4-Channel Low Speed Data Module with V.110 Rate Adaptation

Installation and Operation Manual

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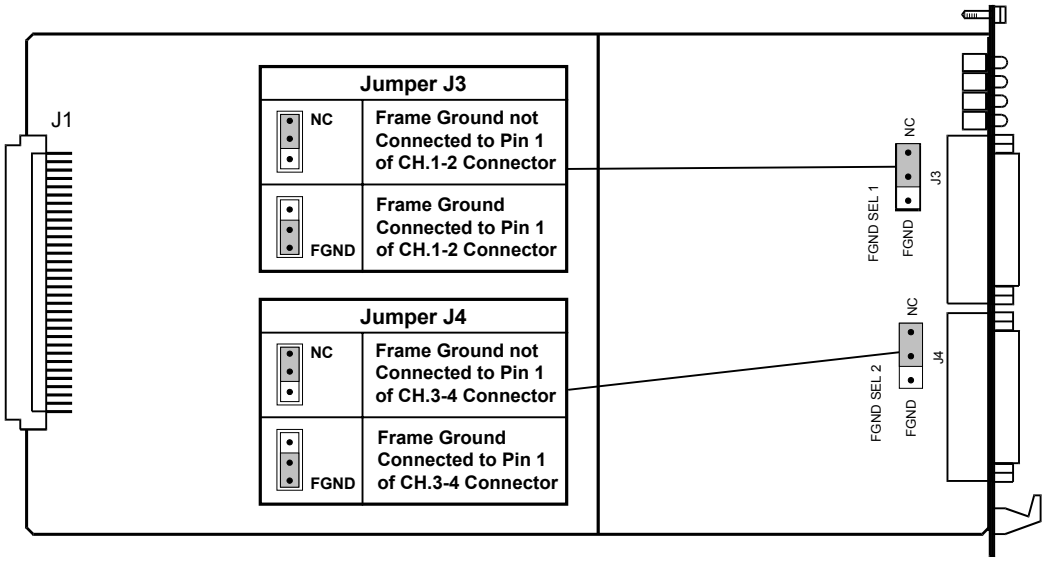
Quick-Start Guide

If you are familiar with the product, use this guide to prepare it for operation.

Preliminary Preparations

Refer to figure below and set jumpers as required.



Insert the module in the assigned I/O slot.

Configuration Procedure

Start HS-R configuration by entering the command: **`DEF CH A:*<CR>`**. The configuration parameters and the allowed range of values are listed below.

Parameter	`TDM Link [systems with CL.1 only]`	`ML Slot [systems with CL.2 only]`	`ML Channel [systems with CL.2 only]`	`Connect`
Range of Values	`IO-1 to IO-12`	`IO-1 to IO-12`	`EX1 to EX2`	`YES` `NO`
Parameter	`Format`	`Rate`	`Operation Mode`	
Range of Values	`ASYNC` `SYNC`	`Async: 0.6, 1.2, 2.4, 4.8, 9.6, 19.2, and 38.4 kbps` `Sync: 0.6, 1.2, 2.4, 4.8, 9.6, 19.2, 38.4, 48, 56, and 64 kbps`	`BIDIRECTIONAL` `UNI-BRD TX` `UNI-BRD RX`	
Parameter	`Data [Async only]`	`Parity [Async only]`	`Stop Bits [Async only]`	
Range of Values	`5 BITS` `6 BITS` `7 BITS` `8 BITS`	`YES` `NO`	`1` `2`	
Parameter	`CTS`	`DCD & DSR`	`Mode [Sync only]`	
Range of Values	`ON` `RTS`	`LOCAL` `END-TO-END`	`DCE` `EXT DCE`	

Assign the required timeslot to each connected channel. Use the **`DEF TS A:B`** command to assign timeslots, and the **`DEF SPLIT TS A:B:C`** command to assign a fraction of a timeslot.

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Chapter 1
Introduction

1.1 Overview

This manual describes the technical characteristics, applications, installation and operation of the HS-R four-channel V.110 data modules for the Megaplex-2100 and Megaplex-2104 family of modular E1/T1 multiplexers.

Note *In this manual, the generic term **Megaplex** is used when the information is applicable to both chassis versions. The complete designation is used only for information applicable to a specific version.*

Applications

The HS-R modules provide four independent RS-232 channels that support full duplex asynchronous and synchronous data transmission in the range of 0.6 through 64 kbps.

The HS-R modules perform rate adaptation in accordance with ITU-T Rec. V.110; multiplexing is performed in accordance with ITU-T Rec. I.460. In addition, the main link data stream generated by the HS-R module is compatible with the data stream generated by the ASM-31 and ASMi-31 modems, offered by RAD.

Figure 1-1 shows a typical low-speed data transmission application using HS-R modules. In this application, two HS-R modules are used to connect remote terminals to a server or communication controller through the Megaplex link. The HS-R modules enable efficient utilization of link bandwidth; for example, the HS-R modules enable the transmission of four 9.6 kbps channels in one 64 kbps timeslot (see *Section 1.3* for additional details).

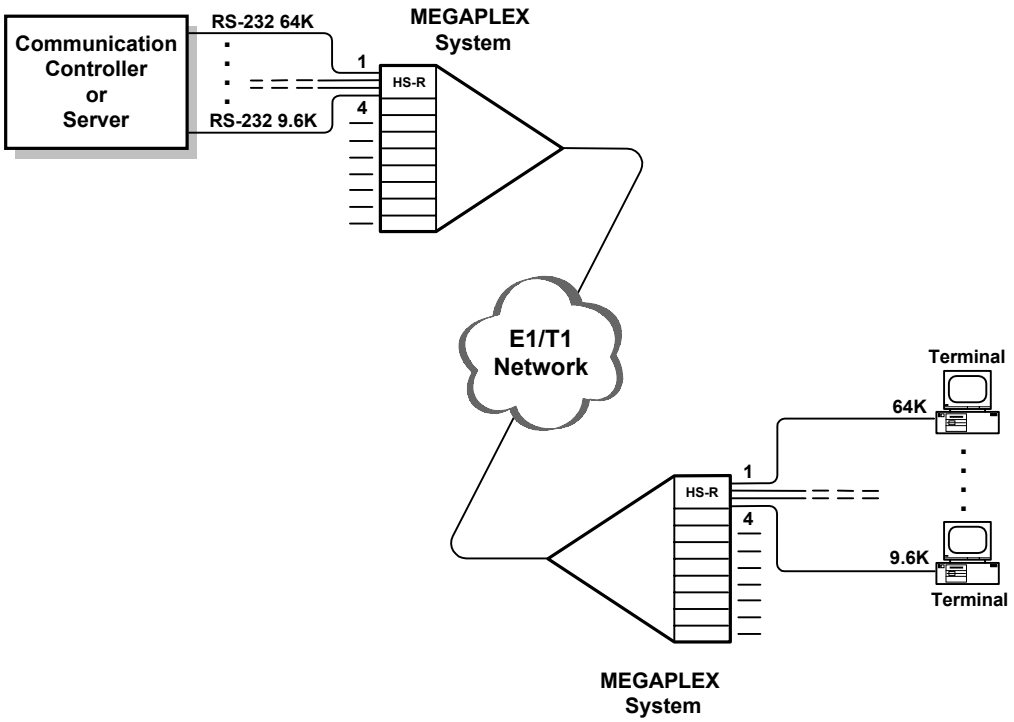

Figure 1-1 Typical Low-Speed Transmission Application

Figure 1-2 shows a typical application for an HS-R module used in conjunction with ASMi-31 modems.

In this application, the HS-R module is used to connect remote terminals, via a Megaplex link:

- At the local end, the terminals are directly connected to HS-R channels.
- At the remote location, the channels of the HS-R module are routed to an HS-U/1 module. The "U" interfaces of the HS-U/1 module, which is configured for operation in the LT (line termination) mode, are connected to separate ASMi-31 short-range modems, offered by RAD, using standard telephone (twisted pair) loops. The remote terminals are connected to the ASMi-31 units with V.110 support.

The maximum range between the HS-U/1 module located at the remote location and the ASMi-31 units, can be up to 5.5 km, thus providing additional flexibility in system configuration.

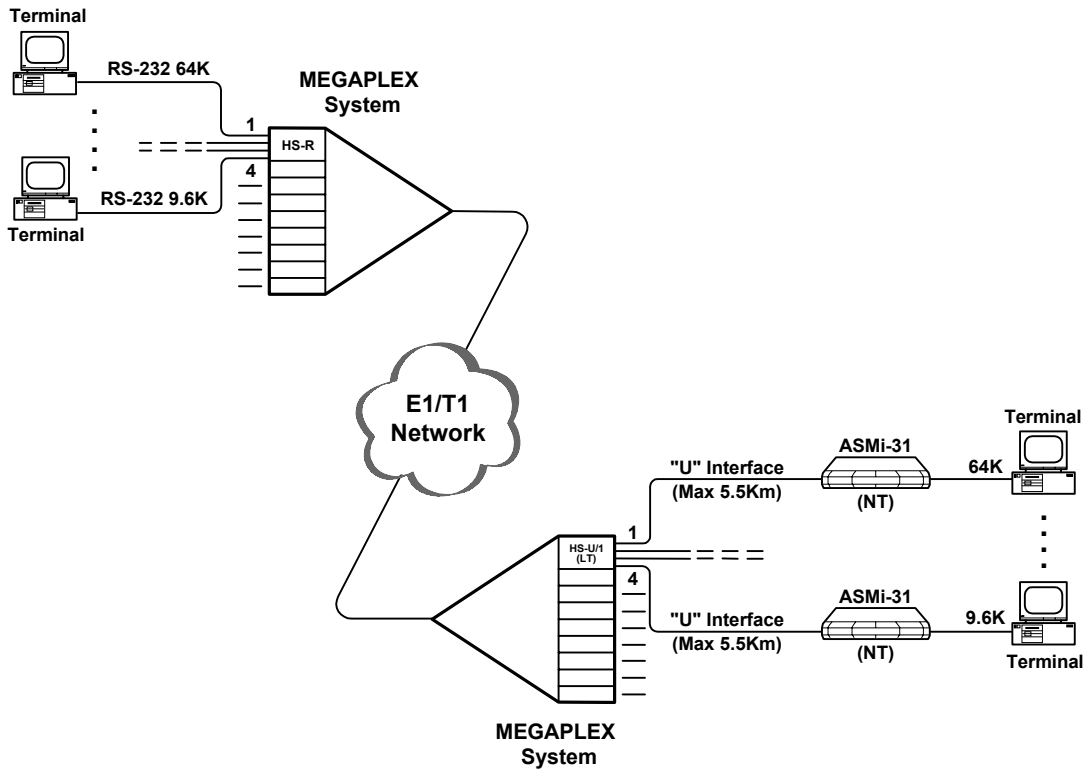

Figure 1-2 Typical Application for HS-R Module in Conjunction with ASMi-31 Modems

1.2 Physical Description

The HS-R modules occupy one I/O module slot in the Megaplex chassis.

Figure 1-3 shows the panels of the 4U-high HS-R module.

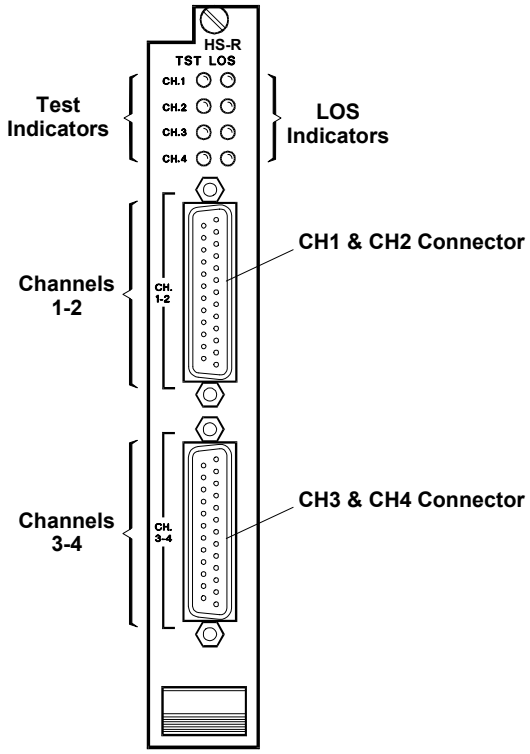

Figure 1-3 HS-R Module Panel

The panels of HS-R modules include two status indicators for each channel:

- The TEST indicator lights up when a loopback is activated on the corresponding channel.
- The LOS indicator lights up when the corresponding channel looses V.110 protocol synchronization to the remote end. Note that when the channel operates at 64 kbps, no framing is used, and thus the LOS indicator lights when the Megaplex main link loses synchronization.

The HS-R module panel also includes two 25-pin D-type female connectors, each serving two channels.

All the functional configuration parameters of the modules are determined by software. Jumpers are used only to control the connection of ground reference to each channel.

1.3 Functional Description

Main Features

Each HS-R channel operates independently. All the channel operating parameters are controlled by Megaplex system management.

Basically, each HS-R channel is assigned an individual timeslot in the T1 or E1 main link frame. The HS-R modules also support split timeslot assignment, therefore improving main link bandwidth utilization.

The timeslots assigned to HS-R channels can be manually assigned by the user. User-controlled manual timeslot assignment allows the routing of the bit stream generated by each local channel to any other compatible Megaplex channel at the remote site, e.g., to another channel of a high-speed module such as HS-2, HS-3, HS-Q, HS-R, HS-S, HS-4, or HS-U, or to another type of module, such as an HS-ETH module.

Channel Characteristics

Each HS-R module channel can be configured by the user for asynchronous or synchronous operation. Each channel has a DCE RS-232 interface.

Asynchronous Mode

The data rates supported in the asynchronous mode are 0.6, 1.2, 2.4, 4.8, 9.6, 19.2, and 38.4 kbps. The V.110 frame structure used at these rates consists of 80 bits.

In the asynchronous mode, the user can specify the structure of the word format to be processed by each channel (this structure must be identical to that used by the user's DTE). The available options are as follows:

- Number of data bits: 5, 6, 7, or 8.
- Use of parity: if the user's DTE word format includes a parity bit, the user can enable transparent end-to-end transfer of the original parity bit. The module itself does not check the parity of the incoming data.
- Number of stop bits: 1 or 2.

In addition to the selected parameters, the word format includes one start bit.

Synchronous Mode

The data rates supported in the synchronous mode are 0.6, 1.2, 2.4, 4.8, 9.6, 19.2, 38.4, 48, 56, and 64 kbps. The V.110 frame structure used in the synchronous mode depends on the data rate:

- At rates up to 38.4 kbps, the V.110 frame consists of 80 bits.
- At 48 kbps, the V.110 frame consists of 32 bits.

- At 56 kbps, an 8-bit frame is used. This frame uses seven frame bits for transparent transfer of the user's 56 kbps data stream, and the eighth bit is always “1”.
- At 64 kbps, no framing is used (transparent transfer of user's data stream).

Interface Control Lines

The RS-232 interface control signals are locally supported in accordance with the RS-232 protocol, with the following modifications:

- The DSR line is continuously active (ON), except when the end-to-end transmission of control signals is enabled.
- The DCD line is ON when the local Megaplex unit is synchronized, and is OFF when the unit loses synchronization.
- For flexibility in application, the user can program the state of the CTS line. The available selections are:
  - The CTS line is continuously active (ON).
  - The state of the local CTS line tracks the state of the local RTS line.
- The user can enable end-to-end transmission of the states of the local DTR and RTS lines to the remote DSR and DCD lines, respectively.

Note that control signals are not supported at the 56 or 64 kbps channel rates.

Channel Connectors

The data channels of the HS-R module are terminated in two 25-pin D-type female connectors: one carries Channels 1 and 2, and the other carries Channels 3 and 4.

As an option, RAD offers two types of channel splitter cables, which enable direct connection of data equipment with RS-232 interfaces to an HS-R 25-pin connector:

- CBL-HSR/F, which terminates into two 25-pin D-type female connectors.
- CBL-HSR/M, which terminates into two 25-pin D-type male connectors.

Timing

When operating in the synchronous mode, the timing of the HS-R channel interfaces is locked to the Megaplex nodal timing.

The timing mode of each HS-R module channel can be selected by the user. Two options are available:

- **DCE:** the interface provides transmit and receive clock signals to the user's data equipment (DTE). The user's DTE must receive and transmit at the rate of the clock signals provided by the HS-R channel interface.

- **EXT DCE (DTE1):** the interface provides a receive clock signal to the user's DTE, and accepts the transmit clock from the user's DTE. The user's DTE must operate with loopback timing; that is, it must transmit at the rate of the receive clock signal provided by the HS-R channel interface. This timing mode is suitable for tail-end applications.

Timeslot Assignment

The HS-R module processes the payload data from all the channels in accordance with the guidelines of ITU-T Rec. I.460. It then organizes the payload data for transmission in the main link timeslots of the Megaplex, to achieve optimal packing of data.

Data in the main link timeslots is formatted in 8-bit groups (octets). In accordance with ITU-T Rec. I.460, channels carrying data rates lower than the B-channel rate can be assigned 2, 4, or 8 bits in each octet. When necessary, rate adaptation is performed to convert the data rate at which the users' DTE actually operates to the rate corresponding to the number of bits that can be assigned in a main link timeslot octet.

Table 1-1 lists the supported user's terminal data rates, the data rate obtained after rate adaptation, the number of B-channel octet bits assigned by the HS-R module to carry the channel payload data, and the corresponding fraction of main link timeslots for each data rate.

Table 1-1 Utilization of Main Link Timeslots

User's DTE Rate	After Rate Adaptation	Number of Bits
0.6 through 9.6 kbps	16 kbps	2 (¼ timeslot)
19.2 kbps	32 kbps	4 (½ timeslot)
38.4, 48, 56, and 64 kbps	64 kbps	8 (1 timeslot)

As shown in *Table 1-1*, the HS-R module uses minimum allocations of two bits (16 kbps). The HS-R module can automatically multiplex the data rates obtained after optimal adaptation, to fill the standard main link bandwidth allocation unit, one timeslot (64 kbps). For example:

- When two channels operate at rates that require two bits (i.e., up to a maximum 9.6 kbps per channel), the main link bandwidth allocated to the two channels is ½ timeslot.
- When all four channels operate at rates up to a maximum 9.6 kbps per channel, the main link bandwidth allocated to the four channels would be one timeslot.
- When two channels operate at 9.6 kbps, one channel at 19.2 kbps, and one channel at 56 kbps, the main link bandwidth allocated to the first two channels would be ½ timeslot, another ½ timeslot for the third channel, and one

additional slot would be used for the fourth channel. Thus, two full timeslots would be required.

The maximum number of main link timeslots that may be required by an HS-R module is four.

The user can enable split timeslot allocation. In this case, each channel which does not require a full timeslot can be allocated the required number of bits (in accordance with *Table 1-1* in a user-selected timeslot.

Configuration and Management

All the module operating parameters are controlled by means of the Megaplex system management., which support flexible timeslot routing. The user selects the timeslots assigned to HS-R channels in the T1 or E1 main link frame, in order to route the bit stream generated by the multiplexing process described above in each local channel.

Each main link allocation unit generated by an HS-R module can be independently routed to any other compatible module installed in the remote Megaplex unit, configured for the same combination of data rates. Moreover, the HS-R modules support split timeslot allocation.

Diagnostics

The HS-R modules support self-diagnostics upon power-up, as well as powerful testing capabilities controlled by means of the system management functions, thereby reducing downtime to a minimum.

The test and loopback functions, that can be individually activated by the system management functions for each module channel, include:

- Local digital loopback.
- Remote digital loopback.

1.4 Technical Specifications

Digital Interfaces

Number of data channels	4
Interface	ITU-T Rec. V.24/V.28, EIA RS-232
Type	DCE
Signal format	User-selectable asynchronous or synchronous full duplex transmission

Data Transmission Rates

Asynchronous mode	0.6, 1.2, 2.4, 4.8, 9.6, 19.2, 38.4 kbps
Synchronous mode	0.6, 1.2, 2.4, 4.8, 9.6, 19.2, 38.4, 48, 56, 64 kbps
Asynchronous character format	User-selectable
Length	5, 6, 7 or 8
Parity bit	Transparent end-to-end transfer, or local parity generation
Stop bits	1 or 2

Interface Control Signals (for rates up to 48 kbps)

Local support

- DSR always ON when module is powered (unless end-to-end transmission is enabled)
- Local DCD is ON when the main link is synchronized
- Local CTS tracks local RTS state, or is constantly ON (user-selectable)

End-to-end transfer (user-selectable)

- Local DTR line to remote DSR line
- Local RTS line to remote DCD line

V.110 Framing	*0.6 to 38.4 kbps*	80-bit frame
	48 kbps	32-bit frame
	56 kbps	8-bit frame (transparent transmission of 56 kbps data stream, 8th bit of each timeslot always set to "1")
	64 kbps	No framing (transparent)
Connectors		Two 25-pin D-type female connectors
Main Link Interface	*Bit mapping*	• 2 bits for 0.6, 1.2, 2.4, 4.8, 9.6 kbps • 4 bits for 19.2 kbps • 8 bits for 38.4, 48, 56, 64 kbps
	Timeslots used	• 4 × 9.6 kbps in one timeslot • 4 × 19.2 kbps in two timeslots • 4 × 38.4/48/56/64 kbps in four timeslots
Indicators	*LOS indicator (per channel)*	• Lights up when the corresponding channel loses V.110 protocol synchronization to the remote end • When operating at 64 kbps, the LOS indicator lights when the main link loses synchronization
	TEST indicator (per channel)	Lights up when a loopback is activated on the corresponding channel
Diagnostics	*Loopbacks*	• Local loopback • Remote loopback
Timing	*Timing source*	RS-232 interface timing locked to nodal timing
	Timing modes	DCE: Transmit and receive clocks to DTE External DCE: Receive clock to DTE, transmit clock from DTE
Configuration		Programmable by the Megaplex system management

Chapter 2

Module Installation and Operation

2.1 General

This chapter provides installation and operation instructions for the HS-R modules. The information presented in this chapter supplements the general installation and operation information appearing in the *Megaplex-2100 System Installation and Operation Manual*.

Warning

Before performing any internal settings, adjustment, maintenance, or repairs, first disconnect all the cables from the module, and then remove the module from the Megaplex enclosure.
No internal settings, adjustment, maintenance, and repairs may be performed by either the operator or the user; such activities may be performed only by a skilled technician who is aware of the hazards involved.
Always observe standard safety precautions during installation, operation, and maintenance of this product.

Caution The HS-R module contains components sensitive to electrostatic discharge (ESD). To prevent ESD damage, always hold the module by its sides, and do not touch the module components or connectors.

2.2 Preparation for Installation

The HS-R modules have two jumpers that control the connection of the frame ground to pin 1 in the channel connectors.

Default setting: pins connected to frame ground.

Figure 2-1 shows the location of the two jumpers for the HS-R. Note that the modules include additional factory-set jumpers that must not be changed by the user.

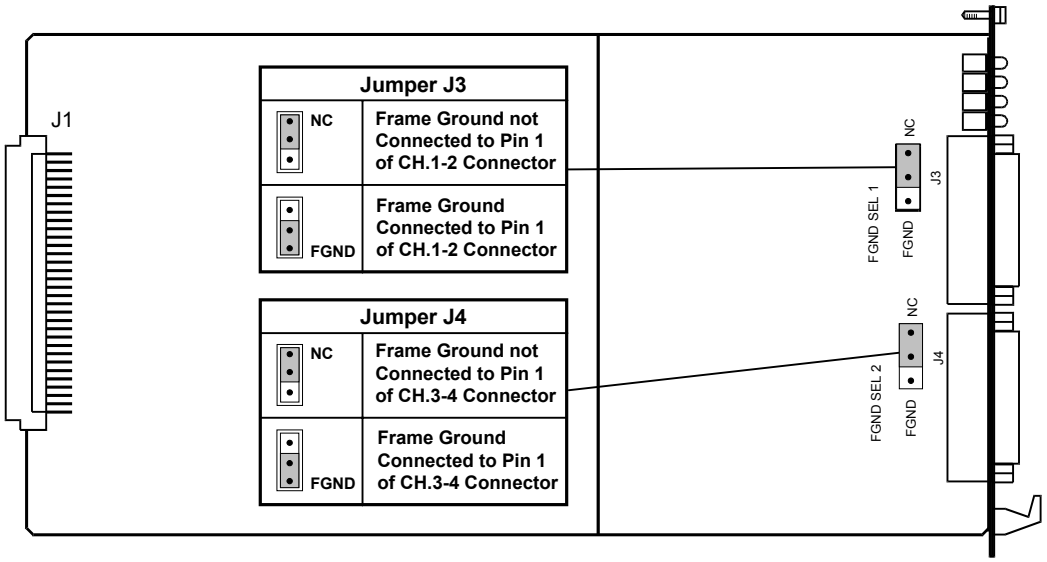

Figure 2-1 HS-R Internal Settings

Module Installation

Refer to the system installation plan and insert the module in the assigned I/O slot of the Megaplex enclosure. The module starts operating as soon as it is plugged into an operating enclosure.

2.3 Module Connections

Interface Data

The connection of user's equipment to HS-R modules is made to the two 25-pin D-type female connectors located on the module panel

Table 2-1 lists the pin assignment of the CH. 1-2 connector, which serves Channels 1 and 2. The wiring of the CH. 3-4 connector, that serves Channels 3 and 4, is similar.

Table 2-1 CH. 1-2 Connector, Pin Assignment

Pin	Designation	Direction	Function
1	FGND	-	Frame ground
2	TD1	IN	TX data, channel 1
3	RD1	OUT	RX data, channel 1
4	RTS1	IN	Request to send, channel 1
5	CTS1	OUT	Clear to send, channel 1
6	DSR1	OUT	Data set ready, channel 1
7	SGND	-	Signal ground
8	DCD1	OUT	Carrier detect, channel 1
9	+12V	OUT	+12V regulated voltage output
10	-12V	OUT	-12V regulated voltage output
11	TXCLK2	OUT	TX clock, channel 2
12	DCD2	OUT	Carrier detect, channel 2
13	CTS2	OUT	Clear to send, channel 2
14	TD2	IN	TX data, channel 2
15	TXCLK1	OUT	TX clock, channel 1
16	RD2	OUT	RX data, channel 2
17	RCLK1	OUT	RX clock, channel 1
18	RCLK2	OUT	RX clock, channel 2
19	RTS2	IN	Request to send, channel 2
20	DTR1	IN	Data terminal ready, channel 1
21	DSR2	OUT	Data set ready, channel 2
22	-	-	Not used
23	TXCLK-EXT2	IN	External TX CLK, channel 2
24	TXCLK-EXT1	IN	External TX CLK, channel 1
25	DTR2	IN	Data terminal ready, channel 2

Cable Connections

Identify the cables intended for connection to each port of this module, and connect them into the appropriate connectors.

Two channel splitter cables are available from RAD. These enable direct connection of data equipment with RS-232 interfaces to an HS-R channel connector:

- CBL-HSR/F, which terminates into two 25-pin D-type female connectors.
- CBL-HSR/M, which terminates into two 25-pin D-type male connectors.

The wiring diagram of the two cables is shown in *Figure 2-2*.

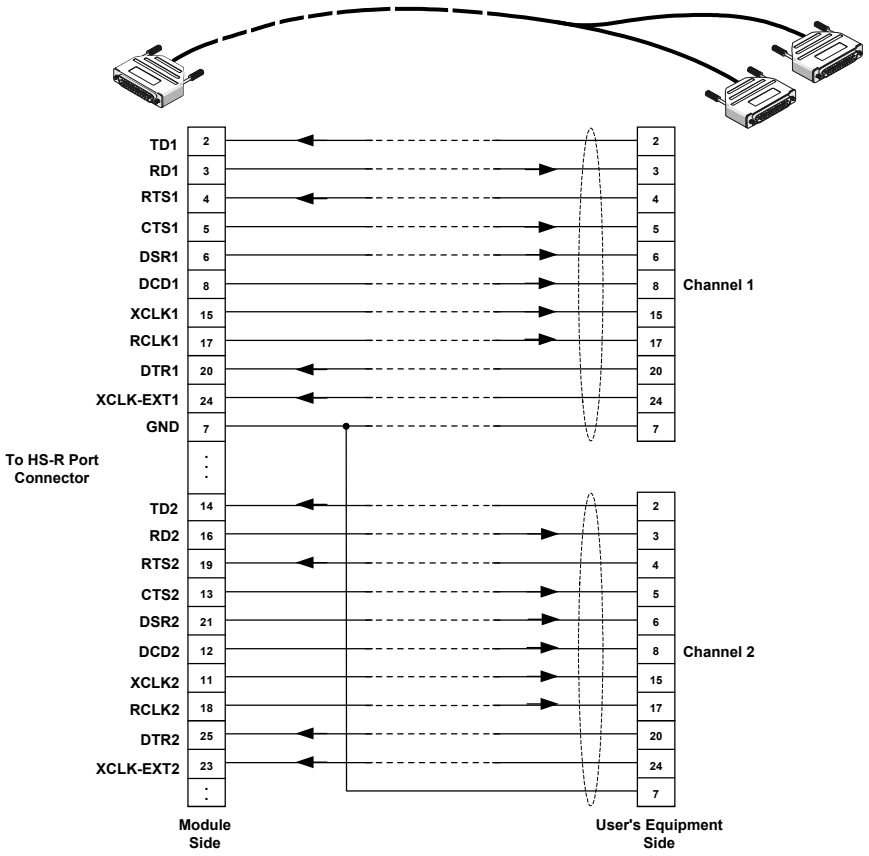

Figure 2-2 Channel Splitter Cable Wiring

2.4 Normal Indications

During normal operation, the LOS indicators of all the connected channels must be off.

The TEST indicators must be off, except when the corresponding channel is engaged in a test. During tests, the channel does not carry user's traffic.

Chapter 3
Configuration Instructions

3.1 Introduction

This chapter provides information on the configuration parameters of the HS-R modules.

The configuration activities required to select the desired values of these parameters are performed by means of the management system used to control the Megaplex unit.

The instructions appearing in this chapter assume you are familiar with the management system being used: a supervision terminal or Telnet (covered by the *Megaplex-2100 System Installation and Operation Manual*), or a network management system, e.g., the RADview network management system (refer to the RADview User's Manual for instructions).

3.2 Configuration Procedure

Table 3-1 explains the programmable channel parameters and their range of values.

Table 3-1 Module HS-R Channel Parameters

Parameter	Description
TDM Link *Systems with CL.1 only*	Selects the main link that will carry the data stream generated by this module. The main link is specified by indicating the number of the I/O slot in which the desired main link module is installed, followed by the module port. **Default: IO-1**
ML Slot *Systems with CL.2 only*	Selects the I/O slot of the main link module to which the channels carried by the corresponding HS-R channel is routed. **Default: IO-1**
ML Channel *Systems with CL.2 only*	Selects the number of the external port (1 or 2) of the main link module selected by the ML Slot parameter. **Default: EX1**

Table 3-1 Module HS-R Channel Parameters (Cont.)

Parameter	Description
Connect	Determines whether the corresponding channel is connected to the main link: **YES** The channel is connected **NO** The channel is disconnected. You can still program the desired parameters, so the channel will be ready to operate when needed **Default: YES**
Format	Specifies the channel operating mode: **ASYNC** Asynchronous mode **SYNC** Synchronous mode **Default: ASYNC**
Rate	Specifies the channel data rate. The available selections are as follows: Async mode: **0.6, 1.2, 2.4, 4.8, 9.6, 19.2,** or **38.4** kbps Sync mode: **0.6, 1.2, 2.4, 4.8, 9.6, 19.2, 38.4, 48, 56,** or **64** kbps **Default: 0.6 KBPS**
Operation Mode	Selects the channel operation mode (refer to the *Megaplex-2100 System Installation and Operation Manual* for details): **BI-DIR** Bidirectional (regular) mode **UNI-BRD TX** Unidirectional broadcast transmit mode **UNI-BRD RX** Unidirectional broadcast receive mode **BID-BRD RX** not supported **Default: BI-DIR**
Data *Async only*	Used to select the number of data bits in asynchronous mode. The available selections are: **5, 6, 7,** or **8 BITS** **Default: 5 BITS**
Parity *Async only*	Used to control the transfer of the parity bit in asynchronous mode. The available selections are: **YES** The parity bit is transparently transferred **NO** The parity bit is not transferred **Default: NO**
Stop Bits *Async only*	Used to select the number of stop bits in asynchronous mode. The available selections are 1 or 2 bits **Default: 1**

Table 3-1 Module HS-R Channel Parameters (Cont.)

Parameter	Description
CTS	Used to control the state of the CTS line. The available selections are: **ON** The CTS line is continuously on **RTS** The CTS line tracks the state of the local RTS line **Default: ON**
DCD & DSR	Controls end-to-end transmission of the local DTR and RTS lines to the remote DSR and DCD lines: **LOCAL** End-to-end transmission disabled **END-TO-END** End-to-end transmission enabled **Default: LOCAL**
Mode *Sync only*	Used to control the clock mode in synchronous mode. The available selections are: **DCE** The channel provides transmit and receive clocks to the DTE **EXT DCE** The channel provides the receive clock to the DTE, and accepts the transmit clock from the DTE **Default: DCE**

Timeslot Assignment

After performing the configuration of the individual module channels, it is necessary to assign the required timeslot to each connected channel. Use the **`DEF TS A:B`** command to assign full timeslots, and the **`DEF SPLIT TS A:B:C`** command to assign a fraction of a timeslot.

Perform manual timeslot assignment as explained in the *Megaplex-2100 System Installation and Operation Manual*.

Chapter 4
Tests & Diagnostics

4.1 General

This chapter provides and explains the module-specific tests and diagnostic functions, and information on the alarms generated by the HS-R module.

The chapter also includes troubleshooting instructions.

The diagnostic information presented here supplements the general diagnostics instructions contained in the *Megaplex-2100 System Installation and Operation Manual*.

4.2 Test and Diagnostic Functions

The available test and diagnostics functions are:

- Local digital loopback on the desired module channel.
- Remote digital loopback on the desired module channel.

The following sections describe the available test activities.

Local Digital Loopback (Local Loop)

The local digital loopback is performed at the input of the digital circuits serving the corresponding channel.

When the loopback is activated, the channel transmit signal is connected to the input of the receive path, and is returned to the user's terminal equipment. The transmit signal is still sent to the remote Megaplex.

The loopback signal path is shown in *Figure 4-1*.

Remote Digital Loopback (Remote Loop)

The remote digital loopback is performed at the receive output of the channel receive path, by connecting the digital signal received from the main link to the input of the channel digital transmit path.

When the loopback is activated, the digital receive signal remains is connected to the input of the receive path, and is returned toward the remote end.

The loopback signal path is shown in *Figure 4-2*.

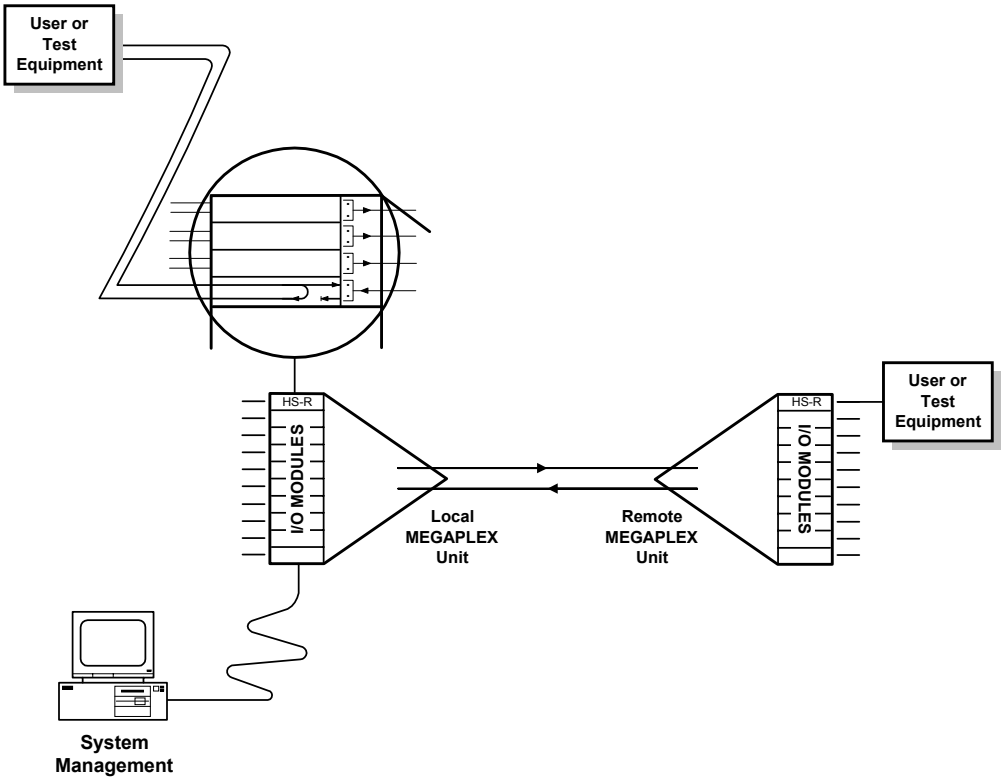

Figure 4-1 Local Digital Loopback, Signal Path

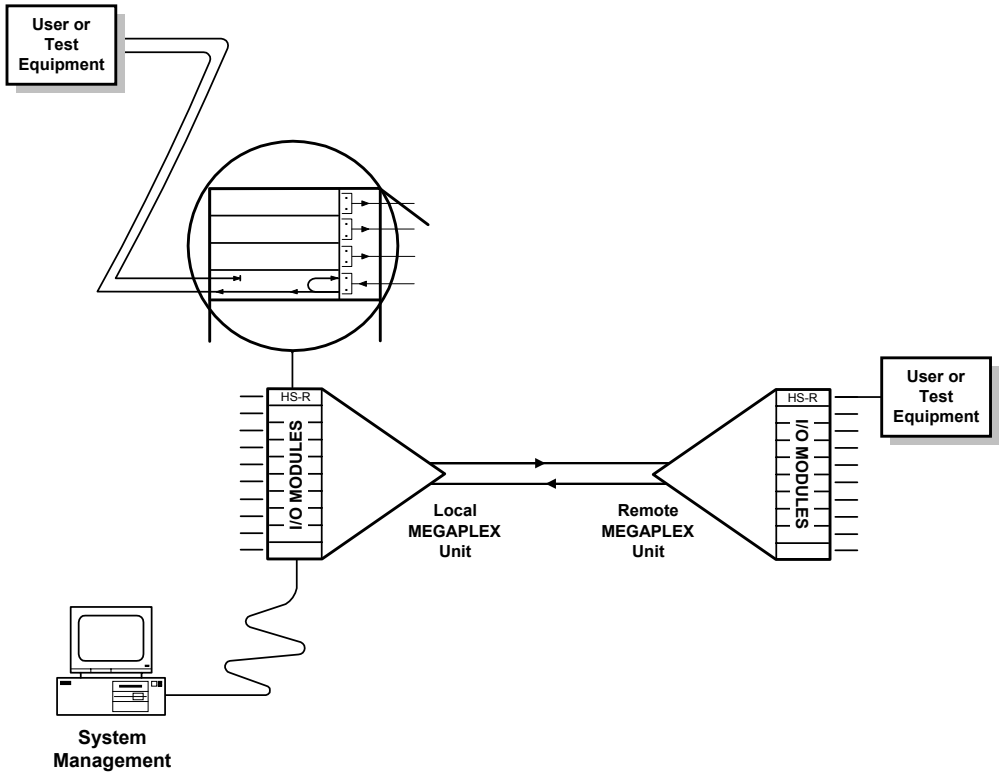

Figure 4-2 Remote Digital Loopback, Signal Path

4.3 Alarm Messages

Table 4-1 lists the specific alarm messages generated by the HS-R module, specifies their type, and explains their interpretation. The module generates additional alarm messages, which are not specific to HS-R modules; these messages are explained in the *Megaplex-2100 System Installation and Operation Manual*.

Table 4-1 HS-R Alarm Messages

Code	Message	Type	Interpretation
021	MODULE WAS REMOVED	Event	The module has been taken out of its slot
022	MODULE WAS INSERTED	Event	The module has been inserted
023	MODULE RESET OCCURRED	Event	The module has been automatically reset
024	MODULE INIT ERROR/ HARDWARE FAILURE	Event	Module initialization, performed upon turn-on or module insertion, has failed, or a hardware malfunction has been detected in this module. Remove the module, and then plug it again after a few minutes. If problem recurs, the module needs service
025	NOT PROGRAMMED MODULE	State (Minor)	The module that has been read from the Megaplex unit is not programmed in the active data base. Change the Megaplex unit configuration as required
026	PROGRAMMED/INSTALL MODULE MISMATCH	Major	The module that has been read from the Megaplex unit does not match the module programmed in the active data base. Check and reconfigure as required
031	COMMUNICATION FAILURE (MP)	Event	The CL module reported a temporary failure in the communication with the HS-R module
211	SYNC LOSS	Major	Loss of input signal or loss of synchronization on a channel

4.4 Troubleshooting Instructions

The loops available on the HS-R module provide a rapid and efficient way to identify the general location of a fault either of the HS-R modules connected in a link, in the external equipment, or in the connections to the channels.

If the LOS indicator of an HS-R channel lights, or a complaint is received regarding the transmission of data through one of the HS-R channels, perform the following procedure until the problem is located. After each step, continue to the next step only if the previously specified test has been successfully completed.

Note *If the problem is detected when a connection between two new users is activated for the first time, before starting the troubleshooting procedure described below thoroughly check the timeslot allocation, the configuration of the two Megaplex units that provide the new connection, and the configuration of the user's terminal equipment*.

- Request the user to perform a local loopback test on the local data equipment. If the user equipment does not receive its own signal, the problem is in the user equipment. After correcting the problem, continue troubleshooting as explained below.
- If the signal is not received when the remote digital loopback is activated, activate the local main link loop on the local Megaplex unit:
  - If the user equipment does not receive its own signal when the main link loop is connected, the problem is in the local unit.
  - If the signal is received when the main link local loopback is activated, activate the remote main link loop.
    If the user equipment does not receive its own signal, the problem is either in the timeslot allocation, or in the remote unit.

Appendix A

Operation with FCD-E1M and FCD-T1M

Operation of the HS-R module with FCD-E1M and FCD-T1M is generally similar to its operation with the Megaplex-2100/2104 family of modular E1/T1 multiplexers, as previously explained in this manual. The differences are seen in the following two areas:

- Configuration parameters
- Alarm messages

This appendix identifies and lists these differences only. For a full description of the configuration parameters and alarm messages, refer to the *Configuration Instructions* and *Alarm Messages* sections in this manual.

A.1 Configuration Parameters

Table A-1 indicates the difference in the channel parameters when operating with FCD-E1M and FCD-T1M.

Table A-1. FCD Channel Parameters

Parameter	FCD Difference
CONNECT	No change
DESTINATION	Not applicable
SIGNAL FORMAT	No change
RATE	No change
DATA (LENGTH)	No change
PARITY BIT	No change
STOP BIT	No change
CTS	No change
CLOCK MODE	No change
TDM LINK	Not applicable
DCD & DSR	No change
PRIORITY	Not applicable
LINK TO	Not applicable
OPERATION MODE	Not applicable

A.2 Alarm Messages

Table A-2 indicates the difference in the alarm messages when operating with FCD-E1M and FCD-T1M.

Table A-2. FCD Alarm Messages

MP Code	Difference	
	FCD Code	**FCD Type**
021	59	Major
022	58	Major
023	52	Major
024	57	Major
025	Not applicable	
026	62	Major
031	51	Major
211	44	Major